

Claims

1. A method for estimating a bit error rate of a received signal of a wireless telecommunication system, said method
5 comprising the steps of:

a) estimating a channel impulse response based on said received signal;

b) subjecting said received signal to a channel equalizing operation performed on the basis of time
10 statistics derived from said channel impulse response;

c) determining adaptive reference time domain characteristics based on an actual weighting information obtained from said channel estimating step;

d) subjecting said received signal to a reference channel equalizing operation performed on the basis of said
15 adaptive reference time domain characteristics; and

e) estimating said bit error rate by comparing output signals of said channel equalizing operation and said reference channel equalizing operation.
20

2. A method according to claim 1, wherein said received signal is a matched filtered signal, and wherein said actual weighting information comprises an information obtained from a corresponding matched filter operation.
25

3. A method according to claim 1, wherein said channel impulse response is estimated by using correlations between received and known training sequences.

30 4. A method according to claim 3, wherein said correlations represent delay spread and multi path propagation effects caused by a radio channel through which said received signal has been transmitted.

5. A method according to claim 3, wherein said correlations are used in said channel equalizing operation as a decision metric addition to matched filtered samples.

5

6. A method according to claim 1, wherein said adaptive reference time domain characteristics are used as a channel delay spread and signal distortion metric in said reference channel equalizing operation.

10

7. A method according to claim 1, wherein said estimating of said bit error rate is performed by calculating a difference between said output signals of said channel equalizing operation and said reference channel equalizing operation over a predetermined measuring period.

15

8. A method for estimating a bit error probability of a received signal of a wireless telecommunication system, said method comprising the steps of:

20

a) estimating a channel impulse response from said received signal;

b) subjecting said received signal to a channel equalizing operation performed on the basis of time statistics derived from said channel impulse response; and

25

c) calculating said bit error probability by using an actual weighting information obtained from said channel estimation step and an output signal of said channel equalizing operation.

30

9. A method according to claim 8, wherein said bit error probability is calculated burstwise on the basis of the following equation:

$$BEP = \frac{1}{N} \sum_{k=1}^N \frac{1}{1 + e^{|a L_k|}}$$

wherein N denotes the number of bits in a burst, L_k denotes a k-th soft bit, and a denotes a channel-specific parameter.

10. A method according to claim 9, wherein said channel-specific parameter is a constant.

11. A method according to claim 9, wherein said channel-specific parameter is calculated on the basis of the following equation:

$$a = b + \frac{E}{E + \text{var}}$$

wherein a denotes said channel-specific parameter, b denotes a predetermined scaling constant, E denotes energy of the burst, and var denotes variance of the burst.

12. A method according to claim 9, wherein said channel-specific parameter is determined in dependence on an amount of phase error determined in said channel equalizing operation.

13. A method according to claim 9, wherein said channel-specific parameter is determined in dependence on an amount of energy included in a predetermined number of taps of said estimated channel impulse response.

14. A method according to claim 8, wherein said
calculating said bit error probability is performed in
dependence on a relation between a standard deviation or
variance and the mean of the means of a predetermined
5 number of soft bits obtained from said channel equalizing
operation.

15. A method according to claim 14, wherein said bit error
probability is calculated using only said predetermined
10 number of soft bits of a block with a smallest mean, if
said relation exceeds a predetermined threshold.

16. An apparatus for estimating a bit error rate in a
received signal of a wireless telecommunication system,
15 said apparatus comprising:
a) estimating means (1) for estimating a channel impulse
response based on said received signal;
b) channel equalizing means (4) for subjecting said
received signal to a channel equalizing operation performed
20 on the basis of time statistics derived from said channel
impulse response;
c) determining means (7) for determining adaptive
reference time domain characteristics based on an actual
weighting information supplied from said estimating means
25 (1);
d) reference channel equalizing means (5) for subjecting
said received signal to a reference channel equalizing
operation performed on the basis of said adaptive reference
time domain characteristics; and
30 e) comparing means (6) for comparing output signals of
said channel equalizing means (4) and said reference
channel equalizing means (5) to obtain said estimation of
said bit error rate.

17. An apparatus according to claim 16, further comprising a matched filter (3) through which said received signal is supplied to said channel equalizing means (4) and said
5 reference channel equalizing means (5), wherein said weighting information comprises an information obtained from said matched filter (3).

18. An apparatus according to claim 16, wherein said
10 estimating means (1) is arranged to estimate said channel impulse response by using correlations between received and known training sequences.

19. An apparatus according to claim 18, wherein said
15 channel equalizing means (4) is arranged to use said correlations as a decision metric addition to matched filtered samples.

20. An apparatus according to claim 16, wherein said
20 reference channel equalizing means (5) is arranged to use said adaptive reference time domain characteristics as a channel delay spread and signal distortion metric.

21. An apparatus according to claim 16, wherein said
25 comparing means (6) comprises counting means for counting the differences between the output signals of said channel equalizing means (4) and said reference channel equalizing means (5) over a predetermined measuring period.

30 22. An apparatus for estimating a bit error probability of a received signal of a wireless telecommunication system, said apparatus comprising:

- a) estimating means (1) for estimating a channel impulse response based on said received signal;
- b) channel equalizing means (4) for subjecting said received signal to a channel equalizing operation performed
5 on the basis of time statistics derived from said channel impulse response; and
- c) calculating means (10) for calculating said error probability by using an actual weighting information obtained from said estimating means (1) and an output
10 signal of said channel equalizing means (4).

23. An apparatus according to claim 22, wherein said calculating means (10) is arranged to determine a channel-specific parameter in dependence on an amount of phase
15 error determined in said channel equalizing means (4).

24. An apparatus according to claim 23, wherein said calculating means (10) is arranged to determine said channel-specific parameter in dependence on an amount of
20 energy included in a predetermined number of taps of said estimated channel impulse response and obtained from said estimating means (1).

25. An apparatus according to claim 22, wherein said calculating means (10) is arranged to calculate said bit error probability in dependence on a relation between a standard deviation or variance and the means of a
predetermined number of soft bits.